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Relevance scale ☐ ☐ ☐ ☐ ☐**1** [Evolving virtual creatures](#)

Karl Sims

July 1994

**Proceedings of the 21st annual conference on Computer graphics and interactive techniques SIGGRAPH '94**
**Publisher:** ACM PressFull text available: [pdf\(84.65 KB\)](#) [ps\(219.40 KB\)](#)
 Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper describes a novel system for creating virtual creatures that move and behave in simulated three-dimensional physical worlds. The morphologies of creatures and the neural systems for controlling their muscle forces are both generated automatically using genetic algorithms. Different fitness evaluation functions are used to direct simulated evolutions towards specific behaviors such as swimming, walking, jumping, and following. A genetic language is presented that uses no ...

**2** [CYBER-SURFING: the state-of-the-art in client server browsing and navigation](#)

Hal Berghel

February 1995

**Proceedings of the 1995 ACM symposium on Applied computing SAC '95**
**Publisher:** ACM PressFull text available: [pdf\(460.71 KB\)](#)
 Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)
**3** [Visualisation: Evolving controllers for virtual creature locomotion](#)

Michael Sanders, Richard Lobb, Patricia Riddle

February 2003

**Proceedings of the 1st international conference on Computer graphics and interactive techniques in Australasia and South East Asia GRAPHITE '03**
**Publisher:** ACM PressFull text available: [pdf\(383.80 KB\)](#)
 Additional Information: [full citation](#), [abstract](#), [references](#)

We consider the application of Evolutionary Algorithms (EAs) to the problem of automating the locomotion of computer-simulated creatures. We introduce *niching* as a way of maintaining genetic diversity and show that it results in the generation of a range of locomotion controllers and increases the probability of finding difficult or rare locomotion modes.

**Keywords:** evolutionary algorithms, locomotion controllers, mass-spring systems,

niching, virtual creatures

#### 4 Multi-level direction of autonomous creatures for real-time virtual environments




Bruce M. Blumberg, Tinsley A. Galyean

September 1995 **Proceedings of the 22nd annual conference on Computer graphics and interactive techniques SIGGRAPH '95**

**Publisher:** ACM Press

Full text available:  [pdf\(87.35 KB\)](#)

 [ps\(560.71 KB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)


#### 5 How does natural language quantify?

Michael Hess

March 1985 **Proceedings of the second conference on European chapter of the Association for Computational Linguistics**

**Publisher:** Association for Computational Linguistics

Full text available:  [pdf\(765.94 KB\)](#)

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Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

It has traditionally been assumed that Natural Language uses explicit quantifier expressions (such as "all" and "most", "the" and "a") for the purpose of quantification. We argue that expressions of the first type are comparatively rare in real world Natural Language sentences, and that the latter (articles) cannot be considered straightforward quantifiers in the first place. However, practically all applications of Natural Language Processing require sentences to be quantified unambiguously. We ...


#### 6 Interaction and design -- I: A swarm algorithm for wayfinding in dynamic virtual worlds



Ji Soo Yoon, Mary Lou Maher

November 2005 **Proceedings of the ACM symposium on Virtual reality software and technology VRST '05**

**Publisher:** ACM Press

Full text available:  [pdf\(558.39 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#), [review](#)

Wayfinding is a cognitive element of navigation that allows people to plan and form strategies prior to executing them. Wayfinding in large scale virtual environments is a complex task and even more so in dynamic virtual worlds. In these dynamic worlds everything, including the objects, the paths, and the landmarks, may be created, deleted, and moved at will. We propose a wayfinding tool using swarm creatures to aid users in such dynamic environments. The tool produces dynamic trails leading to ...

**Keywords:** navigation, navigation/wayfinding aids, swarm intelligence, virtual worlds, wayfinding

#### 7 The virtual oceanarium



Torsten Fröhlich

July 2000 **Communications of the ACM**, Volume 43 Issue 7

**Publisher:** ACM Press

Full text available:  [pdf\(2.17 MB\)](#)  [html\(28.77 KB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

8 VR based entertainment & education: The ANIMUS project: a framework for the creation of interactive creatures in immersed environments ☐



Daniel Torres, Pierre Boulanger

October 2003 **Proceedings of the ACM symposium on Virtual reality software and technology VRST '03**

**Publisher:** ACM Press

Full text available: pdf(366.43 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper describes the architecture of the ANIMUS framework. This framework facilitates the creation of synthetic characters that convey the illusion of being *alive*. The components of ANIMUS are inspired by observations made in biological organisms, and provide means for creating autonomous agents that mimic awareness of their environment, of other agents, and of human audience. They also show particular roles, personality, and emotions, active and reactive behavior, automatic reflexes, ...

**Keywords:** VR entertainment, agent architectures, artificial intelligence, artificial perception, believable agents, broad agents, human-machine interaction, immersive environments, intelligent agents, interactive art, synthetic creatures

9 Autonomous characters & flocking: Generating flying creatures using body-brain co-evolution ☐

Yoon-Sik Shim, Chang-Hun Kim

July 2003 **Proceedings of the 2003 ACM SIGGRAPH/Eurographics symposium on Computer animation SCA '03**

**Publisher:** Eurographics Association

Full text available: pdf(2.19 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper describes a system that produces double-winged flying creatures using body-brain co-evolution without need of complex flapping flight aerodynamics. While artificial life techniques have been used to create a variety of virtual creatures, little work has explored flapping-winged creatures for the difficulty of genetic encoding problem of wings with limited geometric primitives as well as flapping-wing aerodynamics. Despite of the simplicity of system, our result shows aesthetical looki ...

10 Mobile: Open experiments of mobile sightseeing support systems with shared virtual worlds ☐



Hiroyuki Tarumi, Kayo Yokoo, Shoji Nishimoto, Kazuya Matsubara, Yasushi Harada, Fusako Kusunoki, Sangtae Kim, Yuki Mizukubo

June 2006 **Proceedings of the 2006 ACM SIGCHI international conference on Advances in computer entertainment technology ACE '06**

**Publisher:** ACM Press

Full text available: pdf(668.75 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we describe results from the experiments of a location-dependent shared virtual world system applied to sightseeing entertainment. This system can be used with GPS-phones on the current Japanese market. Users can enjoy interacting with virtual objects including virtual animals/agents. Subjects of the experiments were real tourists who had their own GPS-phones compatible with our system. We found that evaluations on the system varied depending on age, gender, and experiences of sub ...

**Keywords:** mobile phones, shared virtual environment, user study

11 Communication through virtual active objects overlaid onto the real world ☐

Hiroyuki Tarumi, Ken Morishita, Yusuke Ito, Yahiko Kambayashi

September 2000 **Proceedings of the third international conference on Collaborative**

**virtual environments CVE '00****Publisher:** ACM PressFull text available: [pdf\(1.46 MB\)](#)Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** CVE architecture, augmented reality, autonomous agents, community computing, mobile systems, overlaid virtual systems, virtual pets

- 12 [Session 2C: life-like and believable qualities: Using an ethologically-inspired model to learn apparent temporal causality for planning in synthetic creatures](#) ☐



Robert Burke, Bruce Blumberg

July 2002 **Proceedings of the first international joint conference on Autonomous agents and multiagent systems: part 1 AAMAS '02**

**Publisher:** ACM PressFull text available: [pdf\(284.73 KB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Inspired by recent work in ethology and animal training, we integrate representations for time and rate into a behavior-based architecture for autonomous virtual creatures. The resulting computational model of affect and action selection allows creatures to discover and refine their understanding of apparent temporal causality relationships which may or may not involve self-action. The fundamental action selection choice that a creature must make in order to satisfy its internal needs is whether ...

**Keywords:** apparent temporal causality, autonomous agents, ethology, planning, reactive systems, synthetic characters, virtual creatures

- 13 [Crowd and group animation](#) ☐



Daniel Thalmann, Christophe Hery, Seth Lippman, Hiromi Ono, Stephen Regelous, Douglas Sutton

August 2004 **ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04**

**Publisher:** ACM PressFull text available: [pdf\(20.19 MB\)](#)Additional Information: [full citation](#), [abstract](#)

A continuous challenge for special effects in movies is the production of realistic virtual crowds, in terms of rendering and behavior. This course will present state-of-the-art techniques and methods. The course will explain in details the different approaches to create virtual crowds: particle systems with flocking techniques using attraction and repulsion forces, copy and pasting techniques, agent-based methods. The architecture of software tools will be presented including the MASSIVE software ...

- 14 [Expressive autonomous cinematography for interactive virtual environments](#) ☐



Bill Tomlinson, Bruce Blumberg, Delphine Nain

June 2000 **Proceedings of the fourth international conference on Autonomous agents AGENTS '00**

**Publisher:** ACM PressFull text available: [pdf\(1.02 MB\)](#)Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** autonomous cinematography, behavior-based agents

- 15 [Information exploration using The Pond](#) ☐

Olov Ståhl, Anders Wallberg, Jonas Söderberg, Jan Humble, Lennart E. Fahlén, Adrian

 Bullock, Jenny Lundberg  
September 2002 **Proceedings of the 4th international conference on Collaborative virtual environments CVE '02**


**Publisher:** ACM Press

Full text available:  [pdf\(2.38 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In this paper we describe The Pond, a system used to search for and visualise data elements on an engaging tabletop display. The Pond uses methods of unencumbered interaction and audio feedback to allow users to investigate data elements, and supports shoulder-to-shoulder collaboration with the physical Pond artefact mediating the collaboration between those people gathered around it. The user interface is based on an ecosystem metaphor, presenting data elements in the form of shoals of aquatic ...

**Keywords:** database, searching, virtual environment, visualization

16 [Art session 1: augmented and virtual spaces for creative learning, collaboration, and play: New ways of worldmaking: the \*Alterne\* platform for VR art](#) 

 Marc Cavazza, Jean-Luc Lugin, Simon Hartley, Paolo Libardi, Matthew J. Barnes, Mikael Le Bras, Marc Le Renard, Louis Bec, Alok Nandi

October 2004 **Proceedings of the 12th annual ACM international conference on Multimedia MULTIMEDIA '04**

**Publisher:** ACM Press

Full text available:  [pdf\(3.36 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We introduce a novel approach to the creation of Virtual Reality Art installations, which supports the design of alternative worlds, in which laws of Physics can be redefined to induce new user experiences. To implement this concept of "Alternative Reality", we have used Artificial Intelligence techniques to support the definition of the virtual environment behaviour, an approach inspired by Qualitative Reasoning systems. Besides the redefinition of physical laws, we have developed mechanisms ...

**Keywords:** causality, digital arts, intelligent virtual environments, qualitative physics

17 [A heterogeneous animated platform for educational participatory simulations](#) 

Bill Tomlinson

May 2005 **Proceedings of the 2005 conference on Computer support for collaborative learning: learning 2005: the next 10 years! CSCL '05**


**Publisher:** International Society of the Learning Sciences


Full text available:  [pdf\(157.48 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#)

This paper describes a multi-user interactive installation featuring real time animated creatures and a mobile interaction paradigm. This paradigm has been designed to serve as a platform for education in a variety of content domains. Drawing on previous research in mobile computing and animated educational systems, this project contributes a novel metaphor for interactions among real and virtual creatures and worlds. This "Land/Water" metaphor offers that virtual space is like land for virtual ...

**Keywords:** handheld/mobile devices, human-computer interaction, participatory simulations, virtual/3D environments

18 [Wolves and cubism: Leashing the AlphaWolves: mixing user direction with autonomous emotion in a pack of semi-autonomous virtual characters](#) 


-  Bill Tomlinson, Marc Downie, Matt Berlin, Jesse Gray, Derek Lyons, Jennie Cochran, Bruce Blumberg  
 July 2002 **Proceedings of the 2002 ACM SIGGRAPH/Eurographics symposium on Computer animation SCA '02**  
**Publisher:** ACM Press

Full text available:  [pdf\(3.11 MB\)](#)


Additional Information: [full citation](#), [abstract](#), [references](#), [citings](#), [index terms](#)

We present a system in which computer-graphical virtual characters may be controlled by a user and also remain "in character." The system allows the user to have high-level control over the actions of a character, while the emotional state of the character is autonomously maintained by the computer. We show how this system functioned as part of the *AlphaWolf* installation, presented in the Emerging Technologies program at SIGGRAPH 2001. Results from a 32-subject human user study support th ...

**Keywords:** autonomous agents, directable characters, emotion, human factors

- 19 [A multi-agent based evolutionary artificial neural network for general navigation in unknown environments](#) 

-  Fang Wang, Eric Mckenzie  
 April 1999 **Proceedings of the third annual conference on Autonomous Agents AGENTS '99**  
**Publisher:** ACM Press

Full text available:  [pdf\(694.38 KB\)](#)

Additional Information: [full citation](#), [references](#), [index terms](#)

- 20 [Prototyping of complex plan based behavior for 3D actors](#) 

-  C. Geiger, M. Latzel  
 June 2000 **Proceedings of the fourth international conference on Autonomous agents AGENTS '00**  
**Publisher:** ACM Press

Full text available:  [pdf\(1.21 MB\)](#)

Additional Information: [full citation](#), [references](#), [citings](#), [index terms](#)

**Keywords:** 3D actors, animation, complex plans, multi-agent system

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